CLAIMS:

1. A chain and sprocket drive system comprising:

a chain having a plurality of pairs of links being interconnected by pins;

one or more generally circular sprockets mounted on a cam shaft having a plurality of teeth spaced about their periphery, the sprocket having roots located between pairs of adjacent teeth for receiving the chain pins;

each of the roots having a root radius extending between the center of the sprocket and a point along the root closest to the sprocket center in a radial direction;

at least one of the roots having a first root radius, and at least one of the roots having a second root radius, the second root radius being less than the first root radius; and

the first and second root radii arranged in a pattern effective to redistribute tensions imparted to the chain, reducing the overall tension force exerted on the chain during operation of the system.

2. The chain and sprocket system according to Claim 1, wherein the chain tensions are redistributed to sprocket orders effective to reduce the overall tension force imparted to the chain during rotation of the sprocket.

3. The chain and sprocket system according to Claim 2 wherein the root radii are arranged in a major pattern and a minor pattern.

4. The chain and sprocket drive system according to Claim 3, wherein the tensions are redistributed to have concentrated tensions at least at four times for every rotation of the sprocket.

5. That chain and sprocket system according to Claim 1 wherein the root radii are arranged in a pattern that also reduced the noise produced by the interaction of said chain of said sprocket.

6. The chain and sprocket drive system according to Claim 1 wherein external tensions are imparted to the chain from sources other than the sprocket, and the sprocket is provided with a root radii pattern effective to offset the external tensions in the chain, reducing the overall tension executed on the chain.

7. The chain and sprocket drive system according to Claim 1, wherein external tensions are imparted to the chain from sources other than the sprocket, and the sprocket is provided with a root radii pattern effective to increase the overall tensions exerted on the chain.

8. The chain and sprocket drive system according to Claim 1, wherein at least one of the roots has a third root radius, the third root radius being less than the second root radius.

9. The chain and sprocket drive system according to Claim 8, wherein the first, second, and third root radii are arranged in a pattern that substantially repeats four times around the sprocket.

10. A sprocket comprising:

a plurality of teeth disposed along a circumference of the sprocket, adjacent teeth having roots therebetween, each of the roots having a root radius defined as the distance between the center of the sprocket and a point along the root closest to the sprocket center in a radial direction; and

a plurality of different root radii arranged in a pattern effective to distribute the tensions imparted to the chain at one or more preselected orders relative to the rotation of the sprocket.

11. The sprocket according to Claim 10 wherein the root radii are arranged in a plurality of patterns, at least one of which is major pattern and at least one of which is a minor pattern.

12. The sprocket according to Claim 10 wherein the pattern of root radii also is effective to reduce the noise generated by the interaction of the sprocket and a chain.

13. The sprocket according to Claim 10 wherein a preselected order comprises the fourth order.

14. The sprocket according to Claim 10 wherein external tensions from sources other than the sprocket are imparted to the chain, and one or more of the preselected sprocket orders are chosen to at least partially offset the external tensions in the chain.

15. The sprocket according to Claim 10 wherein external tensions from sources other than the sprocket are imparted to the chain, and one or more of the preselected sprocket orders are chosen to add to the

external tensions in the chain.

16. The sprocket according to Claim 10 wherein the plurality of different root radii comprises at least a first root radii and a second root radii being less than the first root radii.

17. The sprocket according to Claim 16 wherein the first and second root radii are arranged in a pattern that substantially repeats four times around the sprocket.

18. The sprocket according to Claim 16 wherein the plurality of different root radii comprise a third root radii being less than the second root radii.

19. The sprocket according to Claim 18 wherein the first, second, and third root radii are arranged in a pattern that substantially repeats four times around the sprocket.

20. A method of distributing tensions imparted to a chain and sprocket system, comprising:

providing a sprocket having a plurality of teeth separated by roots;

providing each root with a root radius extending between the center of the sprocket and a point along the root closest to the sprocket center in a radial direction;

providing a plurality of different root radii; and

arranging the root radii between adjacent sprocket teeth in a pattern effective to distribute the tensions imparted to the chain and sprocket system reducing the overall tension force applied to the system.

21. The method according to Claim 20, comprising selecting a root radii pattern effective to concentrate chain tensions at one or more predetermined sprocket orders.

22. The method according to Claim 21 wherein a plurality of root radii patterns are selected, at least one a major pattern and at least one a minor pattern.

23. A method according to Claim 21 comprising selecting the root radii pattern effective also to reduce the noise generated by the interaction of the chain with the sprocket.

24. The method according to Claim 20, comprising concentrating the tensions imparted to the chain by the sprocket at a fourth sprocket order.

25. The method according to Claim 20, comprising selecting the root radii pattern effective to at least partially offset tensions imparted to the chain by sources other than the sprocket to balance the overall tension force imparted to the system by all tension sources.

26. A method of concentrating tensions according to Claim 20, comprising selecting the root radii pattern effective to at least partially add to tensions imparted to the chain by sources other than the sprocket to at least partially balance the overall tension force imparted to the system by all tension sources.

27. A chain and sprocket system adapted for reducing chain tensions in the system, the sprocket comprising:

means for concentrating the tensions imparted to the chain by the sprocket at one or more predetermined sprocket orders; and

means for at least partially offsetting tensions imparted to the chain by sources other than the sprocket.

28. The sprocket according to Claim 27, wherein the predetermined sprocket order is at least the fourth order.

29. An automotive timing system comprising:

a chain having a plurality of pairs of links being interconnected by pins;

a generally circular sprocket mounted on a cam shaft having a plurality of teeth spaced about the periphery, the sprocket having roots located between pairs of adjacent teeth for receiving the chain pins;

each of the roots having a root radius extending between the center of the sprocket and a point along the root closest to the sprocket center in a radial direction;

at least one of the roots having a first root radius, at least one of the roots having a second root radius, and at least one of the roots having a third root radius, the second root radius being less than the first root radius and the third root radius being less than the second root radius; and

the first, second, and third root radii and arranged in a pattern effective to redistribute tensions imparted to the chain and reduce the tension force exerted on the chain during operation of the system.

30. The automotive timing system according to claim 29, wherein the pattern comprises a sequence of second, third, third, second, first, second, third, third, second, first, second, third, third, second, first, second, third, third, and second root radii.

31. The automotive timing system according to Claim 24 wherein the root radii pattern is effective also to reduce the noise generated by the interaction of the chain and the sprocket.

32. A sprocket comprising:

a plurality of teeth disposed along a circumference of the sprocket, adjacent teeth being adapted for contacting teeth of a silent chain, the sprocket having a pitch radius defined as the distance from the center of the sprocket to a center of a joint of the silent chain when a tooth of the silent chain proximate the joint is seated between adjacent teeth of the sprocket,

a plurality of pitch radii arranged in a pattern effective to distribute the tensions imparted to the silent chain at one or more preselected orders relative to the rotation of the sprocket.